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## INFORMATION CIRCULAR

# ESSENTIALS FOR A PRELIMINARY REPORT ON A SMALL LODE-GOLD MINE OR PROSPECT, WITH NOTES ON SAMPLING

[illegible]

BY

Charles Will Wright

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# ESSENTIALS FOR A PRELIMINARY REPORT ON A SMALL LODE-GOLD MINE OR PROSPECT, WITH NOTES ON SAMPLING[1]

By Charles Will Wright[2]

This paper has been written to aid the owner of a small gold mine or prospect in preparing a report on his property for the purpose of interesting capital.

If an owner can afford to do so, he should employ a mining engineer of recognized standing and experience to examine and report on his property, but many owners of small mines and particularly of prospects cannot make the expenditure required for this. Further, many of them do not know how to prepare a description which will cover those features of a deposit on which a potential investor promises his opinion as to its worth. If such an owner is convinced that he possesses an orebody of sufficient grade and size to warrant the required expenditure for a thorough investigation and wishes to present his property to prospective investors, then the following suggestions concerning the proper way to sample his deposit, estimate the tonnage of developed and probable ore, and prepare a report may be of assistance.

The prospector usually has insufficient funds, and as it is necessary to prove the extent of his deposit in some degree before an engineer examines it, he often gets local business men to supply funds for development work in return for an interest in the property. If explorations open up a persistent body of ore with prospects of tonnage, development of the orebody is necessary before the property can become productive. The owners may put up capital for a small initial plant to get the property into production, but often serious mistakes are made in selection of mine equipment and the method used in mining or ore treatment which may later be responsible for the failure of the operation. Often, too, where small mills are installed and insufficient capital is available, ore is consumed as fast as it is developed in order that its yield may be applied toward payment of expenses. Unless an immediate profit is made the mine fails, whereas if the available capital had been spent on development, the property might have been in excellent condition for examination and sale.

An investor is always more interested in the grade and tonnage of developed ore than in any mill which may have been installed. If the owner has not the capital required for a mill it is advisable to spend the available funds on development, leaving the expenditure for an ore-treatment plant to the future investor.

Besides prospects and small mines in process of development, there are a large number of partially developed gold mines in the United States where active operations have been discontinued. Some of these properties under the favorable conditions existing today regarding equipment, labor, and supplies, and because of recent improvements in mining methods and ore-dressing practice, might become profitable producers. If the owners of such mines would prepare a report along the lines suggested in this paper it would aid them in obtaining capital to rehabilitate their properties.

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[1] The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U.S. Bureau of Mines Information Circular 6748."

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## SUGGESTIONS REGARDING THE PREPARATION OF A PRELIMINARY REPORT

The following outline of a preliminary report on a small lode gold mine or prospect is presented as a general guide which may be modified to suit any individual property.

### Summary

Start the report with a short summary giving the name of the property, its location and ownership, size and type of the deposit, characteristics of the ore and adjacent country rock, the average grade of ore, production if any, the amount of development work, the tonnage blocked out, and briefly describing labor, water, and timber supplies and transportation facilities. Terms for an option and a short statement setting forth the investment possibilities of the property should also be included. This summary will give the reader a general idea of the major features of the report which follows and will assist him in grasping its details.

### Location and Accessibility

(1) Name the state, county, and mining district in which the property is situated. Include a small-scale map on which the location of the property is indicated with reference to towns, railroads, roads, streams, neighboring mines, etc. A general map of the mining district or a good county map showing these features is usually acceptable for this purpose.

(2) Give the distance and direction to the nearest highway, railroad shipping point, and town where mining and other supplies are procurable. What railroads, automobile or wagon roads, trails or water routes serve the property? Give condition of roads and describe best routes to the property and the possibility of their improvement. Are the roads suitable for trucking and year-around use?

(3) List telegraph, telephone, and mail facilities.

### General Information

(1) Discuss the character of the country (mountainous, hilly, or level) and principal elevations. Describe streams and vegetation.

(2) Discuss climate with regard to summer and winter temperatures, and annual rain and snowfall. How many months a year is it feasible to work?

(3) Labor. Are experienced miners available, and what are current wage rates for different classes of labor. Is labor union or nonunion?

(4) Water supply. Is the water supply derived from streams, lakes, or the mine itself? Estimate the quantity of water available in gallons per minute. What water rights are owned or are available? State the source of drinking water.

(5) Power. Is electric or water power available? State distance to nearest power line, voltage available, and cost of electric energy. Give distance and cost of water power if available.

(6) Timber. What kinds and amount of growing timber are available locally? State distance from property and cost delivered.

(7) Fuel. Give cost of wood, coal, and fuel oil delivered at property.

(8) Supplies. What are the costs of principal supplies, such as explosives, drill steel, staple foods, etc?

(9) Taxes and royalties. Discuss rates and how applied.

(10) Name adjoining properties and producing mines in the district and give their production records.

(11) Where is the nearest assay office?

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## History of Property

Give a brief history of the property and a record of its development. State the quantity of ore mined and gold recovered by years. Give names and addresses of former owners, operators, or lessees. Include the last profit and loss statement. What dividends have been paid?

## Ownership

Give names of claims, dates of location, where and when recorded, dates of patent, and numbers of mineral entries. List mortgages and indebtedness and describe leases, present or pending litigation, and conflicting claims. If the property is owned by a corporation, state when and where it was incorporated, and give the amount of its capital stock, the classes and par value of the stock, and the names and addresses of officers.

## Description of Property

(1) Give the total acreage of the property, the number of claims, and the size of each.

(2) List all surface improvements and mechanical equipment, such as boarding and store houses, hoisting and pumping plants, air compressor, ore bins, mill, etc., and describe briefly, giving date of erection or installation and stating whether machinery was new or used.

(3) Prepare a plan and sections of underground workings. List shafts and tunnels, and give their dimensions. Describe briefly all drifts, raises, winzes, and stopes. State total linear footage of development in ore, and in country rock.

(4) Include a large-scale map showing the boundaries of the property, locations of surface improvements, mine openings, principal topographic and geologic features, and a plan of the ore deposit.

## Description of Ore Deposit

State the type of the deposit, whether a single fissure, vein, or lode deposit, and whether gold is distributed uniformly or occurs in pockets or in well-defined oreshoots. What is the character of the hanging and foot walls? Are they well defined? Give the strike and dip of the deposit, its maximum, minimum, and average thickness, lengths and heights of oreshoots, and distance apart of oreshoots. Is the ore softer or harder than the wall rock? Can the ore be sorted from waste rock? If there is more than one vein or deposit, describe them separately. Give the strike, dip, and throw (vertical and horizontal displacement) of any faults, and the strike and dip of the inclosing rocks.

## Description of Ore

Describe the ore and its constituent minerals. Give the average value of the gold content per ton and amount of any silver, copper, or other metals. Is the gold visible and free or combined with pyrite or other sulphides? Is there any gold in the adjacent country rock? Give approximate percentages of various gangue minerals. If the ore differs in general character, describe each variety.

## Samples and Assays

Describe exactly by whom, when, and how samples were taken and indicate their source and assays on a sketch map of the workings (see suggestions on sampling which follow). State the sampling interval and the length, width, and depth of the sample channels. When, where, and by whom were the samples assayed? State the weight of the original samples, how they were reduced, and the weight of the final samples for assay.

Grab samples broken from the ore face may be tested in a mortar and gold pan in a preliminary reconnaissance from which a definite sampling plan may be laid out. Although one is likely to be misled if dependence is placed on panning rather than assaying, a good panner can readily detect colors in rock carrying a minimum of 50 cents or $1 per ton in free gold. All rock showing colors should, of course, be sampled and assayed. Panning can be used to outline ore shoots and thereby reduce the expense in sampling and assaying. However too much dependence should not be made on panning. Mine and mill results and calculations of ore reserves based on this method alone have often been erroneous. Preliminary investigations by panning should in all cases be checked by assays from channel samples and the panning method used only as an indicator in guiding the sampling scheme.

## Estimate of Ore Reserves

State tonnages and grade of developed, probable, and possible ore (see suggestions on estimation of ore reserves which follow), and show how estimates were derived, indicating the length, width, depth, and average assay of each block of ground. State minimum gold content assumed in defining boundaries of commercial ore.

## Present Conditions

Are the underground workings accessible? If flooded, estimate the quantity of water in the workings and state the quantity pumped daily when the mine was operated. What is the condition of underground timbering? Are workings caved or otherwise out of repair? State the condition of buildings and mechanical equipment. Estimate the expense necessary to prepare the mine for examination and the portion of this the owner is willing to assume.

## Mining

If the mine has been operated describe the method of mining, timbering, tramming, disposal of waste, pumping, and give the total tonnage of ore extracted. Outline the proposed development work to increase the tonnage of positive ore and to search for new ore.

## Milling

If there is a mill on the property include a diagram and discussion of the flow sheet, giving the percentage of recovery and value recovered per ton of ore mined and milled. Describe equipment and give capacities of individual milling units and power and water consumption per ton of ore treated. If no mill is present or records are unavailable discuss the proposed method of ore treatment. Prepare a flow sheet showing proposed treatment of ore, list equipment needed.

## Costs

Give actual costs obtained in the past or estimate the costs for future mining, milling, and general overhead, including administration, insurance, taxes, depreciation, amortization, royalties, and all other costs, in terms of tonnage to be mined and milled. If these estimates can be stated in cost per ounce of gold, so much the better.

## Probable Profits

In estimating probable profits it is advisable to base these on small-scale operations and a plant requiring a small initial capital outlay, but if large-scale operations are advisable and warranted give estimates based on that scale. The effect of different rates of output on the estimated life of the mine and the ultimate profits should also be added.

## Valuation of Property

The valuation of the property should be justified on the basis of expected profits, showing clearly how the valuation is derived. These estimated profits should be sufficient to return all capital expenditures plus a substantial annual return on such investment within the productive life of the mine.

## Option and Terms of Sale

Include the terms of option, price of the property, cash payments, and deferred payments. State whether owner prefers to retain a definite interest, accept shares in a company, a royalty on the output or some combination of these. If a royalty is desired state clearly how it is to be calculated.

## Photographs and Maps

Photographs of the property and maps supplementing those already mentioned should be included in the report, if they are available. It is advisable to make from 6 to 10 copies of the report in order that it may be presented to various persons or companies without undue delay.

## NOTES ON SAMPLING GOLD-ORE DEPOSITS

Samples should be cut with moil and hammer from channels or grooves at right angles to the strike or course of the vein. Each channel should be of uniform width and depth in order that the same amount of material will be taken from each foot along the length of the channel. The more irregularly the gold is distributed in the ore, the more material must be cut per foot of channel in order to represent with reasonable accuracy the value of the ore at the place sampled. As a rule at least 2 pounds per foot of channel should be taken but when the distribution of the gold is erratic or when only a few samples can be taken, it is best to cut larger samples. It may be advisable with spotty ores to cut as much as 5 pounds per foot of channel.

Sample channels ordinarily should not exceed 5 feet in length. If the ore is uniform in hardness and mineralization over widths greater than this it should be sampled from wall to wall by a continuous channel, but the material broken from each section 5 feet or less in length should be sacked separately and treated as an individual sample.

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When the lode is composed of bands differing in hardness, fracture, or character of mineralization, each band should be sampled separately. The reason for this procedure is that channels in soft material are almost certain to be cut deeper than in harder rock; if the entire width of the vein were included in one cut an undue proportion of the softer ore would enter the sample and the results of the assay would not be truly representative. Sampling the various bands individually will minimize this source of error.

The sample interval, or distance between sample channels, as measured along the strike of the vein, will depend on the size of the orebody, the grade and uniformity of the ore, the variation in the width of the lode, and the amount of money available for sampling and assaying.

Intervals of 15 to 25 feet between samples may be satisfactory in preliminary work, if the gold is uniformly distributed throughout the ore, whereas the abrupt variations encountered in spotty orebodies demand closer sampling, and 5-foot intervals are usually adopted. In any case, after the sample interval has been decided upon, it is best to adhere to it rigidly in order to make the sampling as mechanical as possible, thereby reducing the errors of personal judgment in selecting the samples and avoiding complications in interpreting the results.

Having carefully examined all exposures and determined the proper spacing and size of samples, the sampler is ready to cut the channels.

At least a dozen moils will be needed for one shift's work in hard quartz. They are usually made of 7/8- or 1-inch drill steel, and should be 10 to 18 inches long with their points drawn down as four-sided pyramids about twice as long as the diameter of the steel, except that the tips are tapered bluntly to give strength. If one man is to hold and strike the steel a light hammer (single-jack) 3 or 4 pounds in weight is used. When two or three men work together the hammerman employs a 7- or 8-pound (double-jack) hammer.

In soft ore moils are unnecessary and the samples may be cut with a light prospector's or geologist's pick.

Various receptacles may be employed to catch the broken material. These include powder boxes, canvas sample sacks held open by means of heavy wire rings or hoops, and sheets of canvas. Heavy canvas sacks, each large enough to contain all the material from one channel, are used to hold the cut samples. They should be tied with stout cord or wire.

A stiff brush for cleaning the ore faces before cutting the samples, and a supply of heavy paper or cloth tags complete the equipment ordinarily necessary for sampling.

Procedure.- After cleaning the face to be sampled it is well to outline the channel with a lamp flame, charcoal, chalk, or other suitable means. This facilitates the task of cutting and reduces the chance of taking unequal amounts of material from different portions of the channel.

In sampling drift backs, faces or walls, and sides of shafts, the sample can be caught in a powder box (or sack held open by a wire loop) which is held close against the face and directly under the place being sampled so as to minimize the loss of flying chips and fines. When a sampling sheet is employed, the cloth should be perfectly clean before it is used to catch the first sample, and the sampler should carefully brush all fine particles and dust into the sample sack before the next sample is taken. The loss of flying chips and fines can be reduced by shielding the point of the moil with a heavily gloved hand.

In sampling horizontal exposures in the bottoms of shafts, drifts, and trenches, or on outcrops, holding a gloved hand above the point of the moil is a common method of preventing the cuttings from becoming scattered and lost. A powder box held upside down over the point of cutting is often satisfactory, or a piece of heavy canvas with weighted edges may be used. One edge must be slightly raised to allow room for the moil, but if the box or canvas is placed in line with the direction of cutting, and proper care is used, all of the sample can be retained. When the entire sample has been cut, it is brushed into a pile and sacked, care being taken to gather all the fine particles.

As soon as a sample has been cut it is advisable to locate the place sampled on a sketch map of the lode or vein. The sketch should show the width of the lode or vein and its dip; the width and character of each band that may form a part of the lode the nature of the hangingwall and footwall; the position and dimensions of the sample channel; and the number or other designation of each separate sample.

Each sample should be labeled on the spot. A tag or label should be affixed to the sack and a duplicate put inside on top of the sample. The members on the tags should correspond with those on the sketches.

Individual samples will ordinarily weigh from 5 to 25 pounds and must be reduced in size for assay. Sometimes it is possible to crush them and reduce their size at a nearby mine having sampling equipment. In other cases the best and cheapest course is to load the samples as taken on a truck and haul them to a custom sampling plant or assay office. Often, however, the inconvenience and heavy freight charges involved in shipping original samples from an isolated prospect are so great that the only alternative is to reduce their size before shipment.

The samples should be thoroughly dry before the reduction is begun. Samples that are not excessively wet may sometimes be dried satisfactorily, without being emptied from the sacks, in cookstove ovens, in pans on top of a stove, or in the sun.

The dried samples should be crushed before quartering or splitting. The degree of crushing necessary depends on the character of the ore. In general the finer the gold or the sulphides containing it and the greater the uniformity of their distribution throughout the ore, the less the ore need be crushed. Ordinarily the first crushing should reduce all pieces to one-half inch or less in size. With each successive quartering or split, the portion of the sample retained should be further crushed before the next split.

The preliminary crushing, lacking machinery for this purpose, can be done with a hammer, using a piece of heavy flat iron, or a hard flat rock, for an anvil. If the lumps to be broken are placed in a crushing ring considerable loss of flying chips and fines may be prevented. Such a ring can be made by cutting a 2-inch piece from a length of iron pipe 3 or 4 inches in diameter. All hammer crushing should be done over a canvas sheet 4 or 5 feet square, so that flying particles can be recovered.

Mixing.- Thorough mixing of the samples before they are cut down is necessary in order to insure uniform distribution of the valuable mineral grains throughout the mass. It should be remembered that cutting down a sample is in itself a sampling operation and that just as the object of cutting a sample from an ore exposure is to secure material that will represent as closely as possible the value of the face sampled, so the subsequent cutting-down operation is to obtain in smaller bulk a representative sample of the original material.

Coning.- Large samples are mixed by shoveling on a smooth floor. After a preliminary mixing by repeated shoveling, the material is built up into a conical pile, by carefully emptying each shovelful over the center of the heap.

Rolling.- Mixing by rolling is a better method than coning when the sample is not too large. The material is dumped on a piece of heavy canvas, 4 to 6 feet square. One corner of the sheet is drawn toward the diagonally opposite corner, care being taken to hold the corner as low as possible and to move it horizontally. This produces the desired rolling rather than a sliding action, and by tumbling over one another the particles become mixed. After the first pass the upper part of the sheet is laid back and the rolling is repeated in the opposite direction. The sample is then rolled between the two other opposite corners of the cloth, and the process is repeated, using all four corners, until the material is thoroughly mixed.

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Quartering.- Samples are reduced by quartering when they contain lumps exceeding one-eighth to one-fourth inch in diameter. This method is also used for more finely crushed material when a Jones splitter is not available. The material is coned as previously described and then spread into a disk-like pile by means of a square-pointed shovel or straight edge. The cone should not be tamped down but should be spread into a disk by a spiral movement of the shovel edge, keeping the pile as nearly circular as possible all the while. The blade of the shovel should be held vertically and the material plowed outward by moving the shovel edge around the pile in a circle.

When the cone has been flattened to a disk about one-tenth as thick as its diameter it is marked off into quadrants. The four quarters are carefully separated with the edge of a shovel until they are 2 or 3 inches apart. Two diagonally opposite quarters are then removed and rejected, and all material that belongs in them but which cannot be shoveled is carefully brushed away. The remaining quarters are further crushed, if necessary, remixed (preferably by rolling) and coned and quartered as before until a final sample of the desired size is obtained.

Riffle Splitting.- Mechanical or automatic reduction of the bulk of samples is always to be preferred to coning and quartering. However, these methods are usually too elaborate for use by the prospector, and are particularly applicable to larger quantities than those with which he has to deal. The Jones splitter constitutes an exception, and the prospector that handles many samples would do well to provide himself with one.

## Size of Final Sample

The size of the final sample will depend on the character of the ore, the fineness to which it is crushed, and the care exercised in the cutting-down process. With finely crushed, low-grade ores in which the valuable minerals are fine-grained and evenly distributed, a sample carefully reduced to a few ounces may represent quite accurately the value of the lode at the point sampled. With richer or spotty ores, however, the final sample sent to the assayer should weigh at least 1 pound.

In making the final split both halves of the sample should be saved; one half is sent to the assayer and the other kept as a duplicate to be used if check assays become necessary.

Sacking and Tagging.- The final sample and its duplicate are placed in small sacks of tight-woven duck or, if these are not available, in heavy paper sacks or sample envelopes. The latter are especially suitable for small samples but must be protected against wetting.

Each sample is designated by a number marked on a small card or piece of heavy paper, which is folded tightly and placed inside the sack. The same number or mark is written on the outside of the sack or on a tag tied thereto. The tags need not bear any other description of the sample, but a notebook should be kept, in which each sample is entered by number with notes as to its source and how it was taken, the length and width of the channel, the approximate weight of the original sample and of the final sample sent to the assayer, and any special features that may be important.

## Assaying Establishments

The samples should be sent to a reputable assayer. Every important mining center in the West has reliable assay offices, and frequently the assayers at operating mines are permitted to do outside work.

The Federal Government does not make free assays, but the assay offices of the United States Mint are authorized to make determinations at $1 each for gold and silver assays; $1.50 for lead; and $2 each for zinc and copper. These fees are greater than those of many private assayers and chemists, which is in accord with the Mint's purpose of not competing with private citizens in such work.

Some State agencies make mineral determinations free of charge, and others offer analytical services for varying fees. A few make free assays for residents of the State. A list of these agencies is contained in a recent circular of the Bureau of Mines.[3]

The prospector sampling his own claims seldom need worry about the possibility of his samples being salted. However, if other persons have any interest in the property, or if unusual circumstances arouse his suspicions, it is well to include one or two barren samples in the lot sent for assay. These will provide a safeguard, since if the samplers are salted after they are taken the assay returns will indicate that gold is present where it should not occur. The blank samples will also serve as a partial check on the assayer.

## SUGGESTIONS REGARDING THE ESTIMATION OF THE VALUE AND TONNAGES OF ORE IN A SMALL LODE-GOLD MINE

The estimation of tonnages of recoverable ore is a difficult job even for an experienced mining engineer as it involves many factors, the proper interpretation of which depends largely on personal judgment. The character and geology of the orebody, the cost of mining and milling which determine the lower limit in the grade of material that may be classed as ore, the method of mining which influences possible dilution of the ore with wall rock, the necessity of selective mining, the sorting of vein material underground into ore and waste, the quantity of ore that may have to be left in the mine as shaft, arch, or wall pillars, and many other factors enter into the estimation of recoverable ore. The calculation of ore tonnages is therefore far from a precise or accurate procedure, and the reliability of tonnage estimates depends primarily on the knowledge and judgment of the estimator.

Estimates of tonnage are usually made under three separate heads: "Developed ore," "probable ore," and "possible ore."

Developed ore is generally classed as ore of which the continuity and grade have been proved on at least three sides. Probable ore is defined as ore exposed on two sides with certain conservative estimates for extensions beyond the exposed faces. Possible ore is additional ore the presence of which is indicated by geological conditions and the continuity of similar orebodies in the district.

In most gold-ore deposits the uncertainty as to the grade of the ore is usually greater than that as to tonnage. Estimating the tonnage of developed ore is a relatively simple matter, especially where the orebodies are regular. On the mine map the orebody is marked off into blocks and the average width in feet of each block is multiplied by its length and height. The cubic contents of each block is then multiplied by the weight per cubic foot of the ore and divided by 2,000 to reduce pounds to short tons.

The weight per cubic foot of unmined ore is about 162 pounds for quartz, 168 pounds for schist, granite or limestone, and 300 pounds or more for massive sulphide ores. For siliceous ores which are the most common gold ores the number of cubic feet per ton varies from 11.8 to 12.4. For exact calculations it is necessary to determine the specific gravity of the ore.

Where the samples have been taken at regular intervals, along the vein and on at least three sides of a block the average grade of a given block of ore is calculated as follows:

Multiply the length of each sample in the block by its corresponding assay value to give assay-feet if the lengths have been recorded in feet and decimals of a foot, or to give

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[3] Tyler, Paul M., Public Services for the Identification of Mineral Specimens: Inf. Circ. 6597, Bureau of Mines, April 1932, 12 pp.

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assay-inches if the lengths are recorded in inches. Divide the sum of these products by the sum of the lengths to give the average assay value of the ore in the block. Divide the sum of the lengths of the samples by the number of samples (it being assumed for the sake of simplicity that each sample was cut clear across the vein) to give the average width of the ore in the block. The average length of the block in feet times its average height in feet times its average width in feet gives the total cubic feet in the block. Dividing the cubic feet by the number of cubic feet in a ton gives the tonnage of ore in the block.

Similarly the average grade of all blocks is estimated by multiplying the tonnage in each block bv its average assay value, and dividing the sum of the products by the sum of the tonnages.

Figure 1 shows a group of mining claims with topographic features, vertical sections of the mine workings on which are noted the feet of development work and the places where the samples were taken. Table 1 illustrates the method employed for estimating the tonnage and grade of ore developed in the block between tunnel No. 1 and the 100-foot level.

A precaution sometimes taken against over-valuation is the elimination of all erratically high values, substituting for them the average of the two adjacent samples, but this practice is questionable. If there are enough erratic values to affect the result seriously, there may also be enough high values to justify their inclusion. The proper disposition of erratic samples calls for careful study of each case.

Assays of ore specimens or picked samples are generally misleading and should not be included in a report.

There are different methods and formulae for estimating the ore reserves and value of an orebody that vary with the size, shape, and dip of the deposit and with the amount of development work done and number of samples taken. These are described by Charles F. Jackson and John B. Knaebel in U.S. Bureau of Mines Bulletin 356, Sampling and Estimation of Ore Deposits, which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D.C., for 15 cents. As indicated by its title, this bulletin also discusses sampling methods. The reader is referred to this bulletin for detailed information on estimating the tonnage and value of ore deposits.

Table 1, - Calculation Sheet for Estimation of Tonnage and Grade of Ore in the Block Between Tunnel No. 1 and the 100- Foot Level

| Tunnel No. 1 | | | | 100-Foot Level | | | |
|---|---|---|---|---|---|---|---|
| Sample No. | Assay value, ounces gold per ton | Length of sample, feet[1] | Assay, feet | Sample No. | Assay value, ounces gold per ton | Length of sample, feet[1] | Assay, feet |
| 1 | 0.25 | 3.1 | .775 | 50 | 0.45 | 3.5 | 1.575 |
| 2 | 0.30 | 3.6 | 1.080 | 51 | .72 | 3.1 | 2.232 |
| 3 | 0.20 | 4.0 | .800 | 52 | .97 | 2.9 | 2.813 |
| 4 | 0.50 | 4.5 | 2.250 | 53 | .80 | 3.3 | 2.640 |
| 5 | 0.60 | 6.0 | 3.600 | 54 | .65 | 4.0 | 2.600 |
| 6 | 0.30 | 4.0 | 1.200 | 55 | .60 | 3.8 | 2.280 |
| 7 | 1.05 | 2.0 | 2.100 | 56 | .40 | 4.6 | 1.840 |
| 8 | 1.15 | 1.5 | 1.725 | 57 | .80 | 5.2 | 4.160 |
| 9 | .60 | 3.5 | 2.100 | 58 | .60 | 4.8 | 2.880 |
| 10 | .40 | 3.6 | 1.440 | 59 | .40 | 4.4 | 1.760 |
| 11 | .10 | 4.0 | .400 | 60 | .20 | 5.6 | 1.120 |
| 12 | .00 | 3.0 | .000 | 61 | .82 | 4.5 | 3.690 |
| 13 | .25 | 4.6 | 1.150 | 62 | 1.20 | 4.2 | 5.040 |
| 14 | .30 | 4.2 | 1.260 | 63 | .35 | 3.6 | 1.260 |
| 15 | .15 | 4.0 | .600 | 64 | .29 | 4.1 | 1.189 |
| 16 | .80 | 3.5 | 2.800 | 65 | .32 | 4.0 | 1.280 |
| 17 | .75 | 4.2 | 3.150 | 66 | .44 | 3.6 | 1.584 |
| 18 | .75 | 4.2 | 3.150 | 67 | .72 | 3.1 | 2.232 |
| 19 | .60 | 4.6 | 2.760 | 68 | .31 | 4.0 | 1.240 |
| 20 | .90 | 4.0 | 3.600 | 69 | .50 | 4.2 | 2.100 |
| 21 | 1.25 | 3.2 | 4.000 | | | | |
| 22 | 1.00 | 2.6 | 2.600 | | Totals | 80.5 | 45.515 |
| 23 | .90 | 4.5 | 4.050 | | | | |
| 24 | .30 | 4.0 | 1.200 | | | | |
| 25 | .25 | 4.2 | 1.050 | | | | |
| 26 | .40 | 4.6 | 1.840 | | | | |
| 27 | .50 | 4.0 | 2.000 | | | | |
| 28 | .80 | 3.8 | 3.040 | | | | |
| 29 | .15 | 3.5 | .525 | | | | |
| 30 | .30 | 3.8 | 1.140 | | | | |
| 31 | .60 | 4.5 | 2.700 | | | | |
| 32 | .70 | 5.0 | 3.500 | | | | |
| 33 | .35 | 5.0 | 1.750 | | | | |
| | Totals | 128.8 | 65.335 | | | | |

[1] In this case it is assumed that each sample is a cut clear across the vein.

| | | | |
|---|---|---|---|
| Tunnel No. 1 | 33 | 128.8 | 65.335 |
| 100-foot level | 20 | 80.5 | 45.515 |
| Totals | 53 | 209.3 | 110.850 |

Average assay value of block = 110.850 ÷ 209.3 or 0.530 ounces perton.

Average width of block, 209.3 ÷ 53 = 3.95 feet.

Volume of block = $\frac{350 + 200}{2} \times 100 \times 3.95 = 108,625$ cubic feet.

## CONCLUSIONS

There are few developed gold properties that are not operating. On the other hand, many promising prospects are idle because their owners do not have proper reports to present the merits of their properties to potential investors and thus obtain capital for development. It must be mentioned, however, that owners generally are extremely optimistic as to the value of their undeveloped properties and mining engineers representing buyers are usually conservative and refuse to accept the owners statements without corroborating evidence. The result is that many good ore deposits remain undeveloped. The owner should realize the risk taken by capital in investing in mining property and not be too exacting in his terms; the engineer in turn should not refuse to accept some uncertainties if the prospect is a promising one and the facts are available in proper report form. The risks can usually be divided between the owner and the investor by a long-term option to give the investor time to explore the property, provided that he agrees to spend certain sums or do certain things in development; or by selling the property on a royalty basis with a minimum guarantee, preferably arranging for small payments during the first few years and larger payments later.

If the owner has his mine on the market and it is to be examined by an engineer it is advisable to have the property in presentable shape - the ladders in repair, drifts cleared, decayed timbers removed, machinery cleaned, broken windows in buildings replaced, and the rails, scrap iron, and other material piled up neatly. This, of course, will not affect the value of the property, but it will aid in giving the examining engineer a more favorable impression and may influence his decision. In order to assist the engineer, the owner should have copies of the recorded documents showing ownership of property and timber and water rights, maps of mining claims, and plans of the mine workings available for inspection. If the owner makes a report on his property as outlined such information will be contained in it. The average engineer is just as anxious to give a mine or prospect the benefit of a doubt as the owner is to have him do so, and he welcomes reporting on a mine or prospect that has real merit.

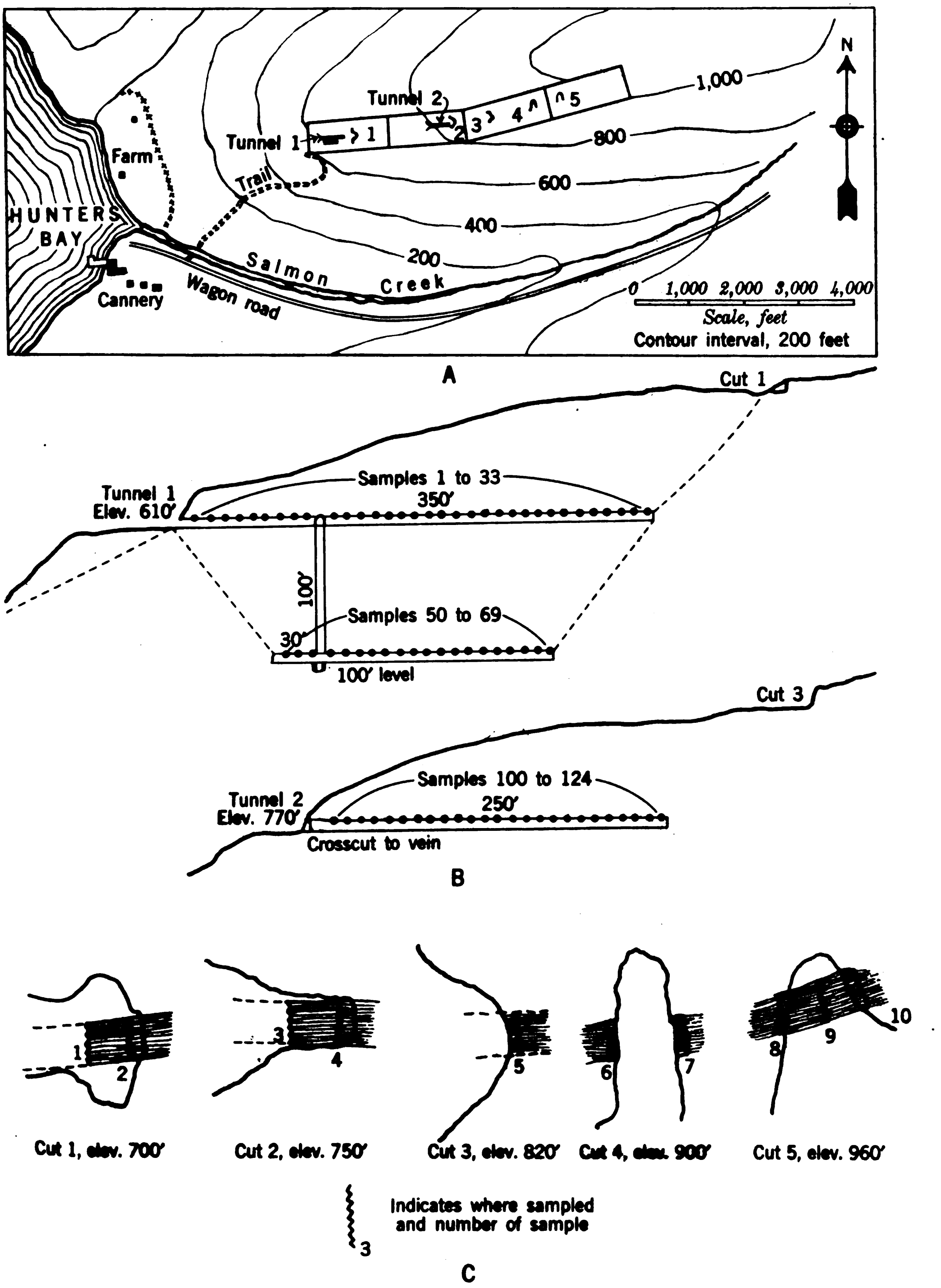

Figure 1.—A, Sketch map showing location of Rex group of claims; B, vertical section through tunnels, C, plans of open cuts.